

Class X

Suggested Pedagogical Processes	Learning Outcomes
<p><b>The learners may be provided with opportunities individually or in groups and encouraged to—</b></p> <ul style="list-style-type: none"> <li>• recognise the difference between reactions, such as, exothermic and endothermic, oxidation and reduction, etc.</li> <li>• observe to understand the difference in the temperatures in both the reactions using laboratory thermometer.</li> <li>• investigate the ways of segregation of waste material on the basis of their degradation property. They may be encouraged to practice the segregation of waste before disposal at home, school, and public places.</li> <li>• explore the relationship between two physical quantities, such as, between potential difference across a conductor and electric current flowing through it; design, conduct, and share the findings of an activity</li> <li>• find out ‘why’ and ‘how’ of processes or phenomena, such as, transportation in plants and animals, extraction of metals from ores, with the help of activities, experiments, and demonstration. The learners may be encouraged to discuss, relate, conclude and explain processes or phenomena to their peers using interdisciplinary approach.</li> <li>• observe diagrams, such as that of digestive system and the names given to various organs. The learners may be motivated to make poster of the digestive system for displaying in school. They may also be provided opportunities to use ICT tools for drawing.</li> <li>• collect wide variety of graphs from newspapers, magazines, or the internet, with a view to understand the information contained therein. The learners may be facilitated to draw a graph, such as V-I graph for analysing the relationship between the potential difference across a conductor and the current through it.</li> </ul>	<p><b>The learner—</b></p> <ul style="list-style-type: none"> <li>• <b>differentiates materials, objects, organisms, phenomena, and processes, based on, properties and characteristics,</b> such as, autotrophic and heterotrophic nutrition, biodegradable and non-biodegradable substances, various types of reactions, strong and weak acids and bases, acidic, basic, and neutral salts using different indicators, real and virtual images, etc.</li> <li>• <b>classifies materials, objects, organisms, phenomena, and processes, based on properties and characteristics,</b> such as, metals and non-metals, acid and bases on the basis of their physical and chemical properties.</li> <li>• <b>plans and conducts investigations and experiments to arrive at and verify the facts, principles, phenomena, or to seek answers to queries on their own,</b> such as, investigates conditions necessary for rusting, tests the conductivity of various solutions, compares the foaming capacity of different types of soap samples, verifies laws of reflection and refraction of light, Ohm’s law, etc. Do variegated leaves perform photosynthesis? Which gas is evolved during fermentation? Why does the shoot of a plant moves towards light?</li> <li>• <b>relates processes and phenomena with causes and effects,</b> such as, hormones with their functions, tooth decay with pH of saliva, growth of plants with pH of the soil, survival of aquatic life with pH of water, blue colour of sky with scattering of light, deflection of compass needle due to magnetic effect of electric current, etc.</li> <li>• <b>explains processes and phenomena,</b> such as, nutrition in human beings and plants, transportation in plants</li> </ul>

- study how chemical equations are balanced using simple mathematical skills. Discussion may be conducted on the significance of balancing of chemical equations.
- get familiar with New Cartesian Sign Convention using illustrated cards and may be given ample opportunities to apply the sign convention in various situations of reflection by spherical mirrors.
- perform a role-play on ecosystem in a hypothetical situation, such as, what will happen if all herbivores suddenly vanish from earth. This may be followed by a discussion about how the loss of biodiversity disrupts the food chain hereby adversely affecting the energy flow in an ecosystem.
- derive equations, formulae, laws, etc. For example, the derivation for formula of the equivalent resistance of resistors in series (or parallel). They should be encouraged to practice the derivation till they are confident.
- study the features inherited through genes, such as, attached or free earlobes. They may be encouraged to observe and compare the earlobes of their friends with the earlobes of their parents and grandparents to arrive at the conclusion that characters or traits are inherited in offsprings from their parents.
- collect print and non-print materials by exploring the library and the internet about scientists and their findings to appreciate how concepts evolved with time. They may be motivated to share their findings by preparing posters and performing role plays or skits.
- encourage learners to visit science museums, biodiversity parks, aviaries, zoological parks, botanical gardens, fisheries, poultry farms, factories, etc.

and animals, extraction of metals from ores, placement of elements in modern periodic table, displacement of metals from their salt solutions on the basis of reactivity series, working of electric motor and generator, twinkling of stars, advanced sunrise and delayed sunset, formation of rainbow, etc.

- **draws labelled diagrams, flow charts, concept maps, and graphs**, such as, digestive, respiratory, circulatory, excretory, and reproductive systems, electrolysis of water, electron dot structure of atoms and molecules, flowchart for extraction of metals from ores, ray diagrams, magnetic field lines, etc.
- **analyses and interprets data, graphs, and figures**, such as, melting and boiling points of substances to differentiate between covalent and ionic compounds, pH of solutions to predict the nature of substances, V-I graphs, ray diagrams, etc.
- **calculates using the data given**, such as, number of atoms in reactants and products to balance a chemical equation, resistance of a system of resistors, power of a lens, electric power, etc.
- **uses scientific conventions to represent units of various quantities, symbols, formulae, and equations**, such as, balanced chemical equation by using symbols and physical states of substances, sign convention in optics, SI units, etc.
- **handles tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices**, such as, pH of substances using pH paper, electric current and potential difference using ammeter and voltmeter, etc.

- collect eco-friendly, commonly available materials to design and develop technological devices and innovative exhibits, such as, electric motor, soda acid fire extinguisher, respiratory system, etc. They may be motivated to display their exhibits or models in science exhibitions, science club, classrooms, during parent-teacher meet and to respond to the queries raised during interaction.
- visit classrooms, laboratories, library, toilets, playground, etc., to identify places where wastage of electricity and water may be occurring. Discussion may be held on importance of natural resources and their conservation, leading to the conviction for adoption of good habits in their day-to-day life. The learners may also organise a sensitisation programme on such issues.
- share their findings of the activities, projects, and experiments, such as, extraction of metals from ores, working of electric motor and generator, formation of rainbow, etc., in oral and written forms. Report writing may be facilitated to share their findings by using appropriate technical terms, figures, tables, graphs, etc. They may be encouraged to draw conclusions on the basis of their observations.
- **applies learning to hypothetical situations**, such as, what will happen if all herbivores are removed from an ecosystem? What will happen if all non-renewable sources of energy are exhausted?
- **applies scientific concepts in daily life and solving problems**, such as, suggest precautions to prevent sexually transmitted infections, uses appropriate electrical plugs (5/15A) for different electrical devices, uses vegetative propagation to develop saplings in gardens, performs exercise to keep in good health, avoids using appliances responsible for ozone layer depletion, applies concept of decomposition reaction of baking soda to make spongy cakes, etc.
- **derives formulae, equations, and laws**, such as, equivalent resistance of resistors in series and parallel, etc.
- **draws conclusion**, such as, traits or features are inherited through genes present on chromosomes, a new species originates through evolutionary processes, water is made up of hydrogen and oxygen, properties of elements vary periodically along the groups and periods in periodic table, potential difference across a metal conductor is proportional to the electric current flowing through it, etc.
- **takes initiative to know about scientific discoveries and inventions**, such as, Mendel's contribution in understanding the concept of inheritance, Dobereiner for discovering triads of elements, Mendeleev for the development of the periodic table of elements, Oersted's discovery that electricity and magnetism are related, discovery of relation between potential difference across a metal conductor and the electric current flowing through it by Ohm, etc.
- **exhibits creativity in designing models using eco-friendly resources**, such as, working model of respiratory,

digestive, and excretory systems, soda acid fire extinguisher, periodic table, micelles formation, formation of diamond, graphite, and Buckminsterfullerene, human eye, electric motor and generator, etc.

- **exhibits values of honesty, objectivity, rational thinking, and freedom from myth and superstitious beliefs while taking decisions, respect for life, etc.,** such as, reports and records experimental data accurately, says no to consumption of alcohol and drugs, sensitises others about its effect on physical and mental health, sensitises for blood and organ donations, understands the consequences of pre-natal sex determination, etc.
- **communicates the findings and conclusions effectively,** such as, those derived from experiments, activities, and projects orally and in written form using appropriate figures, tables, graphs, and digital forms, etc.
- **makes efforts to conserve environment realising the inter-dependency and inter-relationship in the biotic and abiotic factors of environment,** such as, appreciates and promotes segregation of biodegradable and non-biodegradable wastes, minimises the use of plastics, takes appropriate steps to promote sustainable management of resources in day-to-day life, advocates use of fuels which produce less pollutants, uses energy efficient electric devices, uses fossil fuels judiciously, etc.